

FRACTURES OF THE METACARPAL BONES.

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METACARPAL fractures are far more common than the older writers would lead us to believe. For instance, Malgaigne found but sixteen cases in a total of 2377 fractures, or .67 per cent. Hamilton bases his observations on but ten cases. The X-ray has added much to our existing knowledge of these fractures, and it is safe to assume that many cases which have previously been diagnosed as contusions and dislocations have belonged to this class.

But little attention has been given to these injuries, and the scanty literature upon the subject and the brief accounts to be found in our surgical treatises have led me to collect the cases which have come under my observation. The majority of metacarpal fractures present few difficulties. The fractured bone is well splinted by its fellows. Deformity is often slight and reduction fairly easy. A certain number of old cases have been observed in patients presenting themselves for other lesions, and the marked shortening which has followed, resulting in the loss of the knuckle, and the excessive callus which has formed have shown that existing methods of treatment are imperfect.

My own series embraces twenty-seven cases, the greater part of which have presented themselves at the Surgical Clinic of the University of California Dispensary. The fractures have occurred in patients ranging in age from fourteen to sixty-three. I have seen but one case of metacarpal fracture occurring in a woman. Friedrich reports having seen but one female patient in the entire material of his polyclinic. Of my cases, but one has occurred between the ages of ten and twenty years, eight between twenty and thirty years, ten between thirty and forty years, five between forty and fifty

years, two between fifty and sixty years, and one over sixty years. In but one case of the series was more than one metacarpal bone fractured. This was a fracture of both the fourth and fifth metacarpals of the right hand resulting from a fall.

The cases which have come under my observation have been particularly free from complications. None of the fractures were open. Fractures of the phalanges complicating fractures of the metacarpals have not been frequently met with. I have seen but two such cases, the first, a fracture of the first phalanx of the little finger complicating an oblique fracture of the middle of the shaft of that metacarpal and resulting from a fall from a height; the second, a fracture of the first phalanx of the fourth finger complicating a fracture of the fourth metacarpal. This patient had been held up by footpads, and, in endeavoring to defend himself, had received several blows with some heavy weapon across his clinched fist.

In my series I find that the first metacarpal has been fractured in 29 per cent., the second in 15 per cent., the third in 11 per cent., the fourth in 15 per cent., the fifth in 26 per cent., and the fourth and fifth together in 4 per cent. Fractures of the first and fifth bones then have been most frequently met with. This is contrary to the statement of Stimson, who says that the third and fourth are most frequently broken, the first and fifth least.

Nine of my fractures resulted from indirect violence, a blow delivered with the clinched fist, the force being received on the distal end of the bone and operating in the direction of its long axis. Hamilton states that five out of his ten fractures were produced in this way. A force thus applied will generally make an oblique fracture about the middle of the shaft. In one of my nine cases the first metacarpal was involved, the second was fractured in two, the third in two, the fourth in one, and the fifth in three. The fifth metacarpal is probably fractured in glancing blows upward. Another case

of indirect violence said that he had tripped and fallen, receiving the impact of the fall upon the tip of the thumb, held at the time in extension. This produced a fracture at the middle of the shaft. Lonsdale has recorded a case in which fracture of the third metacarpal was caused by a fall upon the end of the outstretched middle finger. The cases of direct violence have resulted from falls upon the back of the outstretched hand caused by slipping on the pavement, or falls from a height, as a wagon or street car. In two cases the injury was caused by blows delivered across the back of the hand, one being a fracture of the first, the other a fracture of the fourth metacarpal.

The first metacarpal bone may be broken at any place in its length. I have found the diagnosis of these fractures extremely difficult in some cases on account of the extensive effusion occurring into the flexor tendon sheath. Two of my cases are especially interesting, as they are good examples of the so-called Bennett's fracture or stave of the thumb (*British Medical Journal*, July, 1886). This is an oblique fracture at the base of the first metacarpal bone. Bennett obtained six museum specimens which showed this deformity. From these he was led to conclude that the fracture was a very common one, and he believed was often mistaken for partial luxation of the metacarpal bone of the thumb. The eighteen years, however, which have followed the publication of Bennett's article have proved his conclusions to be erroneous. The fracture is rare. I have found since Bennett's article but two cases reported in the literature, one by Roberts, of Philadelphia, reporting a case of Dr. G. T. Beatson, of Glasgow, Scotland (*Philadelphia Medical Journal*, March, 1901), the other by Prichard, referred to in von Bergmann's "Surgery."

The history of my first case is as follows:

J. B., a railroad engineer, aged forty-one years, while adjusting the headlight on his engine, slipped and fell. He remained unconscious twenty-five minutes. He resumed work soon after

the accident, but his left hand was very painful. Eight hours later, when he reached the city, his glove had to be cut off. The whole hand was much swollen. Careful palpation of the metacarpal and phalangeal bones revealed no fracture. The hand was treated as a simple contusion and hot applications made. One month later the patient again reported. The thumb was still very painful, especially when adduction was attempted. The patient had not been able to resume work since the receipt of the injury. The maximum tenderness was at the base of the first metacarpal bone. There was considerable fluid in the flexor tendon sheath. Outside of the thenar eminence there was little swelling. The bone was fractured in two places, obliquely just below the articulation and longitudinally running into the joint between the metacarpal bone and the trapezium. The thumb was put up in abduction, being held in this position by an internal rectangular card-board splint. One month later the joint was somewhat stiff, but the patient had been able to resume work.

The following is the history of the second case of Bennett's fracture which I have seen:

T. D., aged twenty-seven years, an oiler by occupation, took part in a street fight two days before he presented himself to me. He reported that he struck a heavy blow with his left fist tightly clinched, the force being received on the head of the first metacarpal. He went immediately to the City Receiving Hospital, where a diagnosis of backward dislocation of the first metacarpal was made and a pasteboard splint applied. On examination, I found great swelling over the thenar eminence. Posteriorly, there was a prominence at the base of the first metacarpal. The thumb appeared slightly shortened. Profiting by my first case, I succeeded in eliciting crepitus at the metacarpal base. The radiograph (Fig. 1) was then taken. It shows a displacement of the distal fragment upward. A slate-pencil coaptation traction splint, to be presently described, was then applied, and this reinforced by a rectangular card-board splint. Function was restored at the end of three weeks.

The displacement in this case was similar to that present in the one reported by Roberts. There was no displacement noted in my first case. The injury is probably caused by a blow upon the tip of the thumb, held at the time in extension, or upon the head of the metacarpal, the fist being clinched. The case cited by Bennett is instructive. A young man, while horseback riding, was thrown violently forward, the tip of the thumb being dashed against the pommel of the saddle.

Through the kindness of Dr. Harry M. Sherman, I have seen a case of spiral fracture of the fourth metacarpal occurring in a woman. This woman was an asylum nurse. The fracture resulted from the corresponding finger being twisted by an insane patient.

Fractures through the metacarpal heads are uncommon. The following case is of interest on account of its rarity and the facility with which reduction was maintained.

P. C., aged twenty-seven years, a longshoreman by occupation, while alighting from a street-car was thrown, violently striking upon the back of his right hand. When he presented himself at the clinic the next day, there was considerable swelling over the second metacarpal-phalangeal joint, the knuckle being greatly depressed. The first phalanx was found to be intact, but its base had sunk on to the dorsum of the hand, resembling a dislocation. On palpation, crepitus was determined at the head of the second metacarpal. There was considerable displacement of the fragment. Fractures at this point are held with the greatest difficulty, and, as the fracture ran into the joint, the patient was told that, notwithstanding what might be done, he would probably have a stiff finger. Reduction was accomplished by means of forcible traction, and the following dressing was then applied. Slate-pencils were placed as coaptation splints on each side of the broken metacarpal, two in the palm and two on the back of the hand. These extended from the metacarpal base to the middle of the shaft of the first phalanx. The slate-pencils were firmly secured in position by means of two narrow strips of adhesive plaster passed about the hand.

Small rubber bands were then placed over the projecting ends of each pair of slate-pencils so that they would press quite deeply into the interosseous spaces. The dressing was then completed by making traction forcibly upon the finger, and maintaining this traction by means of an adhesive strip wrapped firmly about the finger and the projecting ends of the four slate-pencils. Cotton was then placed between the fingers and about the tips of the slate-pencils to prevent rubbing, and the dressing completed by a posterior splint of wood. (Fig. 2.)

On inspecting the hand three days later, I found that the dressing had held remarkably well, nor did the patient complain of it. Although it had been necessary to apply it quite tightly, there had been no interference with the circulation. The dressing was then removed. Seven days after the dressing was applied, the hand was again examined. I was surprised to find that the patient had complete range of motion of the index-finger, and that the affected knuckle was as prominent as the corresponding one on the uninjured side.

This splint has been used with excellent results for all fractures about the heads or distal portions of the shafts of the metacarpal bones. By its use accurate approximation has been obtained, and the callous, deformities and shortening, so common in these fractures, avoided. Traction, difficult to obtain on account of the laxity of the metacarpo-phalangeal joint, has been more satisfactory in this method than in the older modes of treatment which have been previously employed. Small lead-pencils may be used with equal facility. Some slate-pencils are too brittle to be of service. The dressing is applied with considerable difficulty to the second metacarpal, but is easily applied to the third and fourth. For the first and fifth metacarpals the dressing is modified by employing two pencils placed in the interosseous space and one pencil applied laterally. Dressings of the thumb should be reinforced by the internal rectangular splint. In all these dressings a posterior splint of wood or card-board is an additional safeguard.

The dressing recommended by Carl Beck (*New York Medical Journal*, August, 1900) has also been used with good results in cases where traction was not necessary. This consists of a co-

aptation splint made of short pieces of drainage-tube of moderate size applied on each side of the fractured bone on the dorsum of the hand and held in place by strips of adhesive plaster. The old dressing—a roller bandage placed in the palm of the hand, the fingers being drawn down firmly over it—has been employed in a number of cases in this series, but has not given uniformly good results. Traction in this method is very unsatisfactory. The pressure exerted is unequal, and posterior bowing of the fractured metacarpal has occurred. Fractures of the second and fifth metacarpals are very inadequately protected by this method, and no attempt is made to correct lateral deformity.

I have operated for malunion and painful callus in one case in this series. This was a man aged thirty years, a cabinet-maker and a musician. He had fractured his fifth metacarpal, right hand, while striking a punching-machine. He was attended by a physician at the time, but the lesion was unrecognized. When he applied to me one month later, there was a large amount of exuberant callus over the lesion; there was considerable shortening, and movements of the finger were very painful. He had been unable to follow his trade or pursue his musical studies since the accident. Under anæsthesia, an incision was made on the dorsal surface over the fifth metacarpal, the exuberant callus chiselled away, and the bone refractured. The operative wound was then closed and the finger placed on a wooden extension splint, the coaptation dressing of Beek being also employed. The patient had free use of his finger three weeks after the operation. The end result is shown in the radiograph (Fig. 3). There is slight lateral deformity and some thickening over the bone, but the knuckle is prominent. The range of motion is perfect.

The diagnosis of metacarpal fractures presents few difficulties. All the bones are easily palpable, and in fresh cases crepitus can generally be ascertained. For obtaining crepitus, the method recommended by Scudder is useful. "Grasp the finger corresponding to the fractured metacarpal with the whole right hand, steadying the injured metacarpal with the left hand, and make steady and continuous traction." This method serves admirably also for reduction. The fracture heals very rapidly, and for this reason early motion is advisable.



FIG. 1.—Bennett's fracture or stove of the thumb. (Case II.)



FIG. 2.—Dorsal view of coaptation and traction splint of slate-pencils applied to a fracture of the third metacarpal.



FIG. 3.—End result in operation on fifth metacarpal for malunion and painful callus.



Bennett's Fracture, Case IV.